Forest Research Notes

Northeastern Forest Experiment Station

FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 102 MOTORS AVENUE, UPPER DARBY, PA.

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THE BEDDINGTON BURN STAGES A COMEBACK

Today a vigorous young stand of aspen and birch, with an understory of softwoods, occupies the Beddington Burn in Hancock County in southeastern Maine.

However, things did not always look so promising on this burned-over area. In August 1952 a severe fire destroyed the original forest stand and most of the organic material on the forest floor of this 7,600-acre area of industrial timberland.

After the fire, several questions were raised by state and industrial foresters. Would the area restock naturally? To which species? And to what extent or degree of adequacy?

The Northeastern Station was prompted to study natural regeneration and succession on the burned-over land of the Beddington area. The area provided a good opportunity for this study: not only was it a new burn, but also the original stand and the intensity of the fire could be determined, and the soils were well suited for timber production. The rolling topography and well-drained sand and loam soils are typical of an area of glacial moraines and related ice- and water-borne deposits.

During the past two decades forest fires have burned over an average of 4,775 acres annually in the Maine Forestry District.[1] This District of 10,356,042 acres, which encompasses a major part of the spruce-fir region in Maine, is almost entirely privately owned, and is devoted to timber production.

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[1]Wilkins, Austin H. Thirty-second biennial report of the forest commissioner: 1957-1958. Maine Forest Service, 100 pp., illus., 1959.

Though hardwoods such as aspen, birches, fire cherry, and red maple often dominate at first on burned-over lands, there is evidence that some of the finest spruce stands in Maine originated on old burns.

The Study

Sixteen groups of four 1-milacre quadrats were established, and initial seedling counts were made at the end of the growing season in 1953. The total numbers of seedlings per quadrat were again tallied by species at the end of the second, third, and fifth growing seasons to observe possible changes in stand density and composition. However, these quadrats provided only a limited sample of the area, because they were limited to a narrow strip near the eastern edge of the burn.

In the spring of 1955 the study was expanded by adding 45 new groups of four 1-milacre quadrats to provide a more complete representation of the burn and to provide comparative samples of the softwood, mixedwood, and hardwood sites[2] on the northern, central, and southern portions of the burn. However, only the presence of each species on each of the 180 new quadrats was recorded at the start of the third and fourth growing seasons and again at the end of the fifth growing season. These quadrats provide an indication of the distribution of each species over the area.

The Results

With the exception of yellow birch, which is absent from the central portion of the burn, the principal species are more or less evenly distributed over the area. The best indication of the success of regeneration on the Beddington Burn is the fact that only 3 percent of all the quadrats remain unstocked after 5 growing seasons (table 1).

Hardwood stocking.--Aspen and paper birch are the most numerous and widely distributed tree species on the burn. The pioneer hardwoods--aspen, birch, and fire cherry--are present on 96 percent of all quadrats. Though aspen and balsam fir occur more frequently on the softwood sites, paper birch and yellow birch are most common on the mixedwood sites. Fire cherry is common on the burn, but competition has already reduced its numbers on the softwood and mixedwood sites. This short-lived and intolerant species probably will continue to decrease in numbers.

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[2]The forest types previous to the burn were defined as: Softwood--over 75 percent of the basal area in softwood species. Mixedwood--between 25 and 75 percent of the basal area in softwood species. Hardwood--less than 25 percent of the basal area in softwood species.

Table 1.--Distribution of stocking on the Beddington Burn after five growing seasons

(Percentage of quadrats stocked)

Species	Forest site[1]			All quadrats[2]
	Softwood	Mixedwood	Hardwood	
Aspen[3]	**98	87	82	91
Paper birch	38	53	43	42
Fire cherry	17	30	23	22
Balsam fir	**35	8	3	17
Yellow birch	* 5	32	28	16
Spruce[4]	8	10	2	9
Gray birch	2	0	0	6
White pine	3	8	2	5
Beech	0	5	0	4
Red maple	2	3	0	2
Sugar maple	0	0	2	2
Hemlock	0	0	2	1
Not stocked	0	7	7	3
Pioneer hardwoods	100	92	93	96
Softwoods	40	22	8	27
Other hardwoods	2	6	2	6

[1]Data based on the 180 milacre quadrats established in 1955.

[2]Data based on 244 milacre quadrats on all sites (includes 64 quadrats established in 1953 and 180 quadrats in 1955).

[3]Largely quaking aspen, with some big-tooth aspen.

[4]Includes white, red, and black spruces.

*A "t" test showed the differences between this and the other two forest sites to be significant at the 5-percent level.

**Differences between this and the other two forest sites are significant at the 1-percent level.

Softwood stocking.--Softwood seedlings, principally balsam fir, are present on 27 percent of all the quadrats; they form the major component of the understory. Though softwoods are more widely distributed on the softwood sites, the largest number of stems per acre (1,312) occurs on the mixedwood site (fig. 1).

It is worth noting that in November 1952, 3 months after the fire, the ground was littered with balsam fir cone scales. A check of the ages of softwood seedlings in 1959 showed that the establishment of all seedlings examined dated back to the year after the burn. Apparently the seedlings developed from mature seed that survived in the crowns of dead trees, because very few softwood trees survived the burn. The apparent increase in softwood stocking can therefore be attributed to the fact that some of these small seedlings were probably overlooked at the time of the first seedling counts.

Site quality.--The soils on the Beddington Burn apparently are good sites for aspen. The other species present

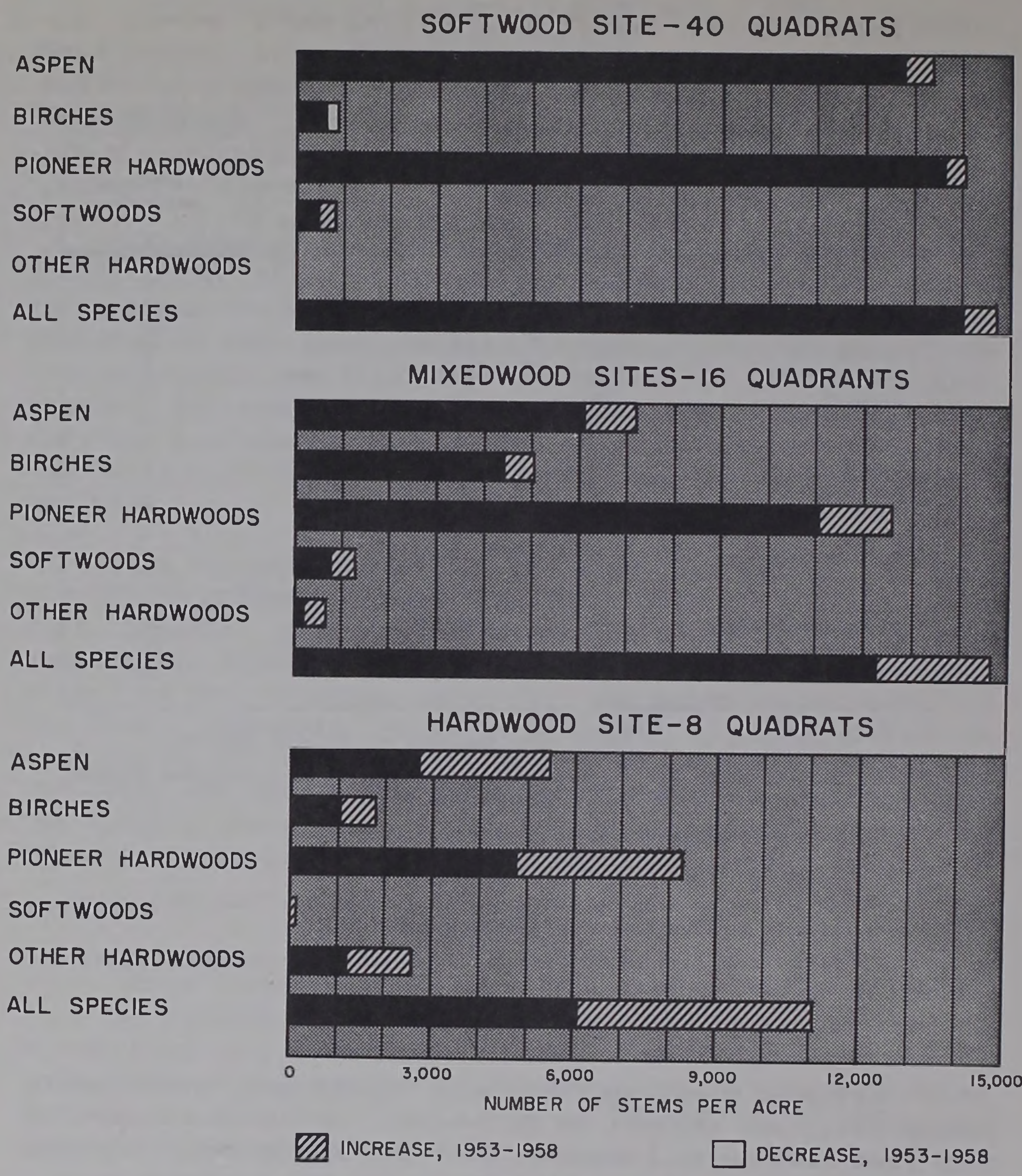

Figure 1.--*Stems per acre on the Beddington Burn at end of first and fifth growing seasons. Data are based on the original 64 quadrats established in 1953.*

are among those commonly associated with aspen where aspen reaches its best development.[3] At the end of the fifth growing season, dominant aspen ranged in height from 8 feet on softwood sites to 19 feet on mixedwood and hardwood sites. One aspen growing on a mixedwood site measured 2.1 inches d.b.h. and 19 feet tall. Heights of the dominant birches approach but do not reach those of aspen.

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[3]Zehngraff, Paul. Possibilities of managing aspen. U. S. Forest Serv. Lake States Forest Expt. Sta. Aspen Rpt. 21, 23 pp., illus., 1947.

According to Gevorkiantz's site-index curves for aspen in the Lake States,[4] the softwood sites on the Beddington Burn appear to have a site index for aspen of 45 (at a base age of 80 years). On the same basis, the mixedwood and hardwood sites have a site index of approximately 80. However, these site-index values are very rough estimates, because it was necessary to project Gevorkiantz's site curves back to height at 5 years before they could be used for these young stands.

Stand changes.--There is some indication of what the maximum stocking levels may be for the pioneer hardwoods on these three sites. The softwood site, with the highest initial stocking of pioneer hardwoods, shows the smallest increase in stocking over the 5-year period; the numbers of birch and cherry on this site have actually decreased. On the other two sites, ingrowth of seedlings, suckers, and sprouts--especially aspen and beech--has narrowed the original differences in overall stocking among the three sites. The numbers of birch, red maple, and sugar maple stems have also increased considerably on the mixedwood and hardwood sites.

One aspen adjacent to each quadrat was pulled up at the time of the initial measurements, and each proved to be of seedling origin. However, in subsequent checks numerous younger aspen of sprout origin were found on the quadrats. Apparently high soil temperatures on the exposed mineral seedbed and widespread deer and rabbit browsing stimulated the development of aspen root suckers.

Competition.--In a few instances, softwood reproduction in the understory on the mixedwood and hardwood sites is undergoing severe competition from hardwoods. This hardwood competition comes chiefly from red maple sprouts and both sprouts and root suckers of beech that developed from root systems surviving the fire. Though the hardwood seedlings have some potential value, the sprout clumps and the beech root suckers, which spring up in dense patches from the old root systems, may seriously interfere with the development of more valuable stems of both hardwoods and softwoods. If this competition intensifies, it may be necessary later to release the desirable stems through appropriate stand-improvement measures.

The most important silvicultural problem suggested by the study concerns the paper birch. As the crowns close, the aspen has a height advantage over the birch. A weeding

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[4] Gevorkiantz, S. R. Site index curves for aspen in the Lake States. Lake States Forest Expt. Sta. Tech. Note 464, 2 pp., illus., 1956.

operation to release an appropriate number of the most promising paper birch trees should substantially increase the value of the stand at maturity.

--BROOKS B. MILLS
Research Forester
Northeastern Forest Experiment Station
Forest Service, U.S. Dept. Agriculture
Bangor, Maine

AGRICULTURE-FOREST SERVICE-UPPER DARBY